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Observation....The first method proposed would impede the ship considerably, be much in the way, and have no sufficient effect to counter-balance these disadvantages. The second method has not the same defects, but as the patentee has only hinted at it, but not described how it is to be effected, his patent cannot of course prevent any one from using the idea, who has ingenuity to overcome the considerable difficulties that are in the way of its practical application.

Account of 110 Acres gained from the sea, on the coast of Essex; by Thomas Quayle, esq. of Reading.

Trans. Soc. Arts VIII. 83.

The natural shore of this district is composed of sand, on the greatest part of it the water for four or five miles to sea is discoloured by a mixture of mud or ooze. This is deposited on the shore; and together with the sea weed driven thither by tempests, and the shells of some species of the smaller testaceous fish, slowly accumulates, and is condensed by the heat of the sun, and the gradual discharge of the sea water during the ebb. In the course of many years, this new soil yields some scattered marks of vegetation. The plants thus appearing, though not of much value, being principally marsh samphire, and other coarse marine productions, have the good effect of giving cohesion to the loose soil, and of enabling it to resist the waves, with which the returning tide covers it. Irregular ravines or rills are however ploughed up, which as they terminate towards the sea, are shallow; nearer full sea mark, as the land rises in height, they deepen to two or three, in a few instances to four or five feet. In some places there is a space of twenty yards between the rills; in other places they approach so nearly, as almost to unite: they are of great advantage to the soil, for where they are wide and deep, the land is more firm in consequence of its being more completely drained during the ebb.

At some distance from high water mark these rills multiply and communicate with each other, the oozy earth sinks in height, and is in great

part covered with salt water, even when the tide is at the lowest. The new land, so far down as any continued marks of vegetation are discoverable, is called the *saltings*; where the shallow numerous rills converge, and the naked sand appears, it is termed the *chalis*.

Beside these rills numerous pools receive the sea water in the middle of the saltings: these are called *pans*, and are filled with stagnant water and weeds, and are very injurious both to the soil and the air; during the neap tides the sun exhales most of the water from these pans, but the spring tides replenish them before they are quite exhausted. The tenant of these saltings had cut drains from the pans on them to the next rills, and the water having thus an issue from them, the weeds and mud hardly ever failed to fill them up, which rendered these saltings superior to those adjoining.

Mr. Quayle on visiting in 1807 this farm, which is situated between the Malden and Burnham rivers, and presents a face of about a mile to the sea, saw the advantage of embanking the extensive saltings attached to it: the soil outside the old sea wall appeared of the same quality as that within, a marine plant called there crab-weed, which is thought to indicate soundness and fertility of soil, grew luxuriantly on it, and the ground was firm to the foot beyond the wall for a considerable distance.

Besides the usual difficulties, this undertaking had two peculiar to it; the first arose from the necessity of carrying a rivulet, called Asheldon brook, through the wall at a great expense, as it was the only drain for the fresh water of the country of the hundred for some miles; and its regular discharge being of the highest importance to the neighbourhood, on account of the land lying on a dead flat. The marsh bailiff's under the commission of sewers for this level, were well informed and liberal men, and obligingly concurred in giving every aid and information in their power. The other difficulty was caused by a piece of low land of about twenty rods in breadth, bottomed with perfectly liquid mud,

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which runs quite through the saltings, at about two hundred yards from the brook, from the old wall in a right line to the sea; which is supposed to have been the original channel of the brook. In crossing this low (as it is called) it was necessary to alter the direction of the wall in order to avoid getting on the chatts, so as that it should form an obtuse angle towards the land; and also to raise earth for the construction of the wall at some distance, that it might not be subject to the subsidence, which was to be expected, if it was formed of the soft materials, which the spot itself afforded.

Early in February, in the following year, a contract was made with two companies of sea-wallers, one of twenty, the other of ten men, for the erection of a new wall in front to the sea, thirty four feet wide at the top, with a slope of two feet for every foot in height at the sea side, and one foot and a half at the land side. A ditch running parallel with the wall at the land side, at the distance of twelve feet, was also to be sunk, twelve feet wide at the top, four feet deep, but not to exceed the width of five feet at the bottom to prevent the sides from slipping in.

The men were restricted by the contract from raising any earth at the land side of the wall, except what the ditch yielded, or from raising any within twelve feet at the sea side. In order that more time might be given the wall to settle, it was directed not to be raised above five feet, till the whole was carried to that height, and then the other three feet were to be added. No great danger being apprehended from the impulse caused by any side wind on the lateral embankment, from its being shielded by the adjoining saltings, it was ventured gradually to contract the width of the lateral walls, as they approached the land, from thirty four feet to twenty four feet, the height continuing the same.

For the principal wall the contractors were to receive at the rate of thirty shillings the matsh rod of twenty-one feet: for the side walls one guinea; barrows, scaffolding, and every other necessary utensil except shovels were

to be found them; and a recompense was to be allowed for filling up the deep rills over which the wall was to be carried, and for extra labour in crossing the low before mentioned. A space being left between the foreland of the new wall marked out and the chatts, sufficient to afford good earth for the wall, the work immediately commenced; sometimes thirty wallers were employed at other times less, but as they worked with spirit, by the beginning of July the front wall was nearly completed, a space of about twenty five yards being however left at each side of Asheldon brook.

In the mean time a gutter had been cut out of seasoned oak, for the conveyance of this brook under the wall—this was sixty feet in length, seven feet two inches wide, two feet six inches deep in the clear, with an apron eight feet long, and spread eight feet. For several days eight men were employed to prepare the spot for the reception of this gutter, by making a dam or semicircular dyke on the sea side, five feet high, and twelve feet wide at the bottom. In passing the channel which the fresh water had usually taken, it was necessary to construct the dam with more solidity, and stronger than the wall itself, it exceeded thirty feet at the base, was twelve feet high, and was piled and planked internally.

Another slighter dam was made on the land side, meeting that on the sea side, in order to keep off the fresh water from the men when laying the gutter; when they cleared away all the water from the circular space, the bottom was found to be so soft and cozy, that a ten feet pole could without much effort be forced down to the end, it was thought prudent to remove the soft earth, in the direction in which the gutter was to be placed, to the depth of two feet, or two feet and a half, and of the width of twelve feet at the bottom. An equal quantity of the driest earth on the saltings was then barrowed in, and rammed down as closely as possible with a small mixture of hay: The cills nine inches square of the length of the gutter, being then put down, thirty joists, eight inches wide, and

five inches thick, were dovetailed into them, and the space between the joists, and without the cills, as far as the soft earth had been removed, was closely rammed with the driest earth and hay, level with the joists.

The studs being next put in, the planking, and the rest of the carpenters' work proceeded without any difficulty. The earth over the gutter, when finished, was rammed in the same manner as at the bottom and sides, the whole width and length of the outfall, till it was level with the saltings, with so much care, that the number of men employed in ramming and stowing the earth was three times that of those borrowing it in. The sea wall was then carried over the gutter in the usual manner. The hay was used merely to prevent this tenacious earth from sticking to the rammers. Piles driven under the gutter, might at first sight, appear to have made the foundation more solid; but it was thought best not to use them, as piles had been found subject to sink unequally on this bottom, which might produce a partial depression of the gutter, and a consequent failure in the due conveyance of the water to the sea.

As the slightest error in construction or position of this gutter might be attended with ruinous consequences not only to the work in hand, but to many upland farms, the greatest caution was used in the operation. The progress was much slower in this part than in any other of the embankment, but as soon as it was finished, one gang of the men soon threw up the sidewalls. By the middle of November the whole was completely embanked, and one hundred and ten acres were added to the farm, of land, which promised to be equal to most in England in fertility.

That the vegetation of any plants, besides those which nature has suited to a soil saturated with sea water, was not to be expected in such situations, is the opinion of the most intelligent cultivators in Essex; but as different ideas and practices prevailed in other coasts, where recent embankments had been made, Mr. Quayle fenced off about twenty square rods at the eastern end of the newly

gained land, in which he made the experiment of sowing ray grass, clover, wheat and various other seeds and plants; and the result seemed to confirm the opinion of the Essex farmers, as no plant appeared above ground, but white mustard, which vegetated weakly; he thinks however that the experiment should be repeated with other seeds, and with various kinds of manure. The improvement of the land was to be expected chiefly from the effect of rain in washing away the salt and detached marine acid, and of course the more rain that fell, the sooner would this be effected.

When the embankment was completed, one of the wallers was engaged to reside on the farm, and to be constantly on the watch during the winter months to repair any flaw which might happen in tempestuous weather: when any earth was washed from the wall, this man immediately filled up the breach, and was also employed in making good the foreland, where any traces of the old rills were left. For more security the whole foot of the wall was piled and planked throughout the low, and a couple of small break-waters, twelve or fourteen inches high, extending from the wall to the end of the foreland, were added in the most exposed places.

In a few months after being embanked, the new land was sufficiently firm to bear a horse, the rank sea weeds daily disappeared, and not a drop of water stagnated on it, the earth round the rills cracked, and nearly filled without any aid. It was then expected to be fit in a few years to receive the plough, but it seemed more advisable to convert it to pasture, as it was so disposed that fresh water might be led into every division of it.

The embankment, besides its direct advantages, had also that of enabling the old land above it to be more completely drained, both from the subsidence of the new land, and the more perfect cleaning and deepening of the sluices which it admitted.

Mr. Quayle concludes his paper, by acknowledging the advantage he received from the account of Mr.

Harriot's embankment in the 4th vol. of the Society of Arts (which has been inserted in our 24th number) and declaring that it was this led him to engage in the work, which but for it he would probably have never attempted,

Observations.—The circumstance in this paper, which seems most to deserve being pointed out to the attention of the gentlemen who may have similar works in contemplation in this kingdom, is the construction of the large trough for conveying the water of the brook through the bank. Where a trough can carry off the water of a stream, it is evidently a less expensive mode of conveying it through the new enclosure, than that of constructing banks at each side of the stream up to the high ground. In the extensive flats in the vicinity of Belfast, which will in a few years be secured from the sea, if the meritorious example set here in this respect by Mr. May, and Mr. Thompson (who lately have so happily succeeded in rescuing near 100 English acres altogether from the waves) be followed as it deserves, several instances will occur where the above information may be useful; as numerous small brooks traverse those flats, which may be easily and cheaply passed through the sea bank in troughs, but which it would be very expensive to embank at both sides. The space left between the bank and the ditch also deserves to be noticed, on account of the security which it gives the bank, as does also the slope given to the bank internally, as well as externally. Mr. Quayle's candid acknowledgment of the advantage he derived from Mr. Harriot's papers, which concludes his communication, does him so much more credit, as many from a mean and unjust pride pursue a contrary system, and while they avail themselves of the thoughts of others, pretend they acted from old conceptions of their own; but dates and other facts in general betray their furtive pretensions, and expose them to deserved ridicule.

Scheme for preserving the Lives of persons Shipwrecked; by G. Cumberland, esq

Phil. Journal, xxvii. 134.

A few years ago Mr. Cumberland, residing near the sea, at a place called Weston Super Mare, frequently observed extensive masses of the sea weed called tang, which the farmers burn for manure, floating into the hollow coves, on the surface of the most tremendous waves; and forming as it were, a green carpet, that undulating on the broken waves was never submerged, although continually varying its surface; and on which, as on a resting place, birds frequently alighted, or sat to repose themselves, as if on a verdant down.

On a coast so remarkably dangerous, where no boat could land even in comparatively tranquil weather, these *safe rafts* seemed very interesting, and led Mr. Cumberland to the thought, that a raft of this nature might be constructed of other materials, fit instead of birds to carry men. The result of this was, that it appeared to him, that if each sailor in a man of war had a mattress of cork shavings, and that these mattresses were all linked together by cords, a float capable of landing men safely, even on breakers, would be produced.

Mr. Cumberland on going to Bristol to consult a cork-cutter relative to these mattresses, found that a very moderate weight of cork would support a man, and that cork shavings were then worth only eightpence per bushel, and were sold chiefly for firing, or to make guards for privateers to fill the nettings.

From this it therefore seemed manifest to Mr. Cumberland, that as mattresses are necessary in the navy for the hammocks, and as nothing is dryer than cork, or easier to shave into a thin elastic body, good mattresses might be made of this substance, in a proportion equal to support the weight of a man, and that a mass of them thrown overboard linked together by ties at each corner, where cords might be always attached, would form an extensive raft, cap-